To the 120th anniversary of the first semantic radiogram

History of the development of telecommunications Radio communications
Stages of the development of radio communications

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120 years ago, on March 24 (12), 1896 in Russia, for the first time in the world, semantic text was transmitted by means of electromagnetic waves by wireless telegraphy. The article is devoted to the study of the details associated with the radiogram that took place in our country, the study of the circumstances of sending the first radiogram abroad.

Radio predictions

In the 1880s, the young German physicist Heinrich Rudolf Hertz; 1857-1894, under the influence and on the instructions of the famous German physicist and physiologist G. von Helmholtz (Hermann Ludwig Ferdinand von Helmholtz; 1821-1894) conducted a series of laboratory tests works confirming the correctness of previously formulated hypothetical provisions of the English physicist-mathematician J. Maxwell (James Clerk Maxwell; 1831-1879) on the presence in nature of electromagnetic waves invisible to the eye. The results of his two-year theoretical and practical research G. Hertz published in December 1888 [1]. Since that time, fantasies on telegraphy without wires began to excite educated minds.

In Europe (in Russia too), the imminent arrival of a spatial exchange of telegrams through the air seemed obvious-probable even to political functionaries [2]. In 1890, an article by one of the teachers of Russian physicists, an extraordinary professor at the Imperial St. Petersburg University (subsequently a corresponding member of the Imperial St. Petersburg Academy of Sciences, an honorary member of the Russian Academy of Sciences and the Academy of Sciences of the USSR) Orest Danilovich Khvolson (1852-1934), published in the Russian magazine "Electricity", the editors accompanied with their own comment about the possibility of "telegraphy without wires, like an optical one" [3].

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ПОПОВ

Fig. 1. A granite bust of A.S. Popov on the "Alley of Scientists" of Moscow State University on the Sparrow Hills.

A year after the presentation of the works of G. Hertz, the discoverer and inventor of the radio Alexander Stepanovich Popov (1859-1906) (Fig. 1) in the Mines officer class designed compact and efficient devices, similar to the vibrator and resonator of a renowned physicist, suitable for laboratory work in an educational institution. On March 7 (February 23), 1890, at the Kronstadt conference of mines and other officers in the lecture "The latest research on the relationship between light and electric phenomena", he first acquainted the fleet specialists with the achievements of science and technology in the field of electromagnetic waves, showed the assembled installation to demonstrate the experiments of G. Hertz's "detection of electromagnetic waves".

Long-term assistant A.S. Popova, a brilliant Russian radio engineer Pyotr Nikolayevich Rybkin (1864-1948), in his book "Ten Years with the Inventor of Radio: Pages of Memories" [4] wrote about A.S. Popov about the experiments of G. Hertz: "In his lectures, Alexander Stepanovich Popov already repeatedly expressed the idea of the possibility of using Hertz rays to transmit signals over a distance." Nikolai Nikolaevich Georgievsky (1864-1940) - another assistant to A.S. Popov, later a professor of physics at the Technological Institute of the Emperor Nicholas II also testified: "Even before

1891, A.S. Popov in a close circle of people close to him expressed the idea of using Hertz rays to transmit signals over a distance "[3].

The term "radio" (from Latin radius, radiare, radio - to emit, irradiate, radiate in all directions) was first coined by the famous English chemical physicist, a member (from 1863) and future president (1913-1915) of the Royal Society of London (analogue of the Russian Academy of Sciences) W. Crookes (William Crookes; 1832-1919). In 1873, in a vacuum tube, using a balance beam, he measured the atomic weight of the waist element that he discovered and discovered a violation of the balancing of a high-precision instrument in the event of thermal radiation. A little later, a similar effect of light radiation was noticed. Based on the discovery, a measuring device - a “radiometer” was designed.

Subsequently, other devices invented by eminent scientists appeared containing the prefix “radio” in the name. The most famous is the "radio conductor" (radio conductor) proposed by the French physicist, future member of the French Academy of Sciences (1911) E. Branly (Edouard Eugene Desire Branly; 1844-1940) for the detection of electromagnetic oscillations in laboratory conditions.

In 1892, in the English general journal Fortnightly Review (Two Weekly Review), which writes also about spiritualism, W. Crookes, who admitted contactless biological communication between the heads of people, published the article Some Possibilities of Electricity. The Russian version of it can be found in the collection [5], literature [6].

W. Crookes did not conduct experiments on the technique of formation and reception of electromagnetic waves. However, the article described an imaginary transceiver system. By selection, he understood the fixed tuning of the system, the allocation by it of a range of waves of total width, for example, from 40 to 50 m or all transmitted by the human eye. The publication is considered the starting point for the interpretation of the concept of “radio”. Other terms stated in the text, such as generation, range, sensitivity, selectivity and others, also later became common.

Even Crookes wrote: “... These are not just the dreams of a dreamy scientist. Everything that is needed to implement this in everyday life is within the scope of the invention and all this is so reasonable and so clear from the studies that are now being actively conducted in every European capital that on any day we can hear about how from the realm of reasoning, it went into the realm of undeniable facts ... ”

Over the years, in 1923, another famous English physicist, president of the London Physical Society (1899-1901) and president of the British Association for the Advancement of Science (1912-1913) Oliver Joseph Lodge; 1851-1940, called the article “an amazing example scientific prediction "[6].

Who invented the radiogram text

At the end of January 1896, in the conditions of the part of Kotlin Island adjacent to Kronstadt and the technical premises of the Kronstadt branch of the Imperial Russian Technical Society, A.S. Popov on meter waves for the first time in the world tested the transceiver system in relation to maritime communications. The transmitter and receiver were connected to the same antennas in the form of symmetrical vibrators with metal square sheets at the ends. By agreement with the customer, he transmitted certain encoded messages.

January 31 (19), 1896 in Kronstadt A.S. Popov already at the next meeting of the Kronstadt branch of the company demonstrated the possibility of practical use of equipment at sea, transmitting telegraph communication signals to a distance without wires. The same antennas with parabolic reflectors were used in the transmitter and receiver.

Fig. 2. Imperial St. Petersburg University at the end of the XIX century

In early March 1896, communications checks were started in classrooms and on the territory of the Imperial St. Petersburg University (Fig. 2). As a test, several phrases and sentences were used.

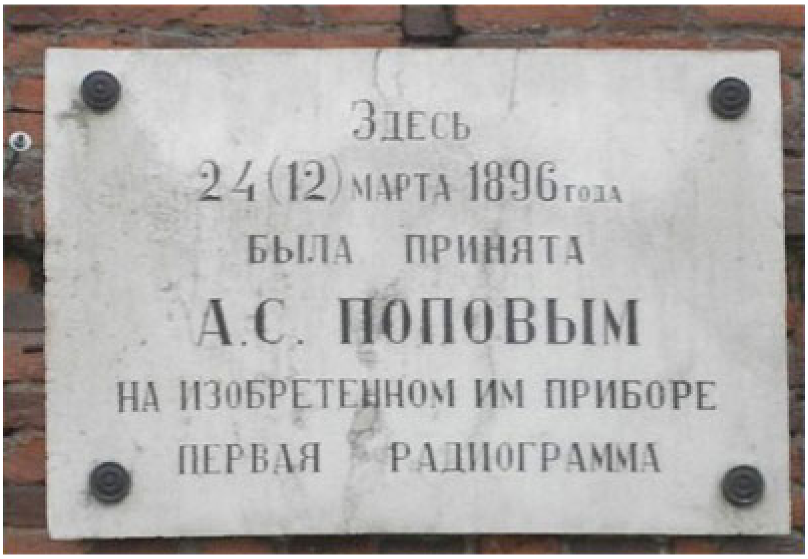

Fig. 3. A memorial plaque on the wall of the audience in which the first semantic radiogram was received.

March 24 (12), 1896, at the next 158th scientific meeting of the Russian Physicochemical Society, held at the Imperial University of St. Petersburg, A.S. Popov together with P.N. Rybkin between the buildings of the educational institution at a distance of 250 m organized a wireless transmission of a two-word text message (Fig. 3). In the demonstration, they also used the manufactured transceiver system of the decimeter electromagnetic wave range with parabolic antennas [7]. The receiver was placed in a shielding box (Fig. 4). The meeting was attended by many famous Russian physicists, electrical engineers, administrative leaders of the army and navy.

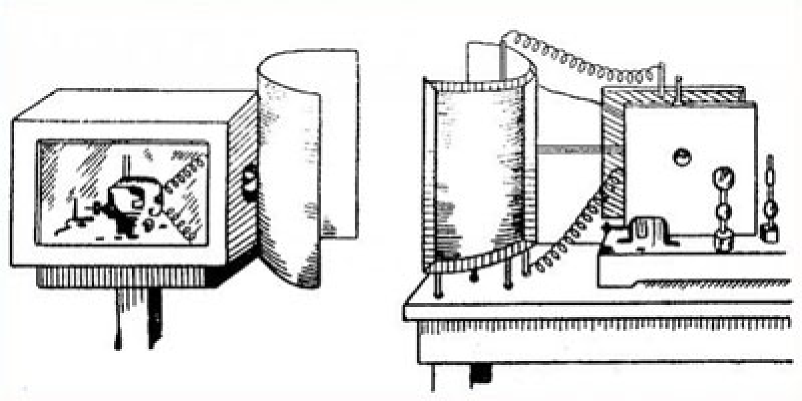

Fig. 4. The receiver (left) and the transmitter used by A.S. Popov when broadcasting the first radiogram.

Here is how, in 1906, the event was twice described by O.D. Hvolson: “The departure station was arranged in the hall of the chemical laboratory of St. Petersburg University, the reception station in the meeting room, in the old physics room. The transfer took place in such a way that the letters were transmitted in the Morse alphabet and, moreover, the signs were clearly audible. At the blackboard stood the chairman of the Russian Physical Society, prof. Fedor Fomich Petrushevsky (1828-1904), holding a paper with a key to the Morse alphabet and a piece of chalk. After each sign transmitted, he looked at the paper and then wrote the corresponding letter on the board. Gradually, the words <Heinrich Hertz> and, moreover, in Latin letters, turned out on the board. It is difficult to describe the delight of the many present and the applause of A.S. Popov, when these two words were written. "[3, p. 94–97, p.

At the beginning of 1945 P.N. Rybkin in a book of memoirs prepared for publication “Ten Years with the Inventor of Radio: ...” [4] described the event similarly: “On March 24 (12), 1896, A.S. Popov made a report again in the Russian Physicochemical Society. In the physics room of St. Petersburg University, on a small table, stood the world's first radio receiver. A thin conductor stretched from it to the window where the vertical antenna was installed. I was at the transmitter, which was installed at a distance of about 250 m from the receiver at the building of the Chemical Institute, which is behind the University Botanical Garden.

Demonstration of experiments was preceded by a small introductory word by the inventor, in which Alexander Stepanovich explained the device of the new receiver. Then the experiments began. At the blackboard, in the physical audience, stood our common teacher, beloved professor Fedor Fomich Petrushevsky. He was holding a piece of paper with a Morse code key and a piece of chalk. After each sign transmitted, Fedor Fomich looked at the paper and then wrote the corresponding letter on the board. Soon the audience could read the words: <Heinrich Hertz> on the board. This was the text of the world's first radiogram.

During the lecture, Alexander Stepanovich, talking about the device of the receiver, emphasized that it was intended solely for the lecture demonstration of Hertz's experiments. The inventor kept silent about the possibility of using it for radio communications. Popov had a special reason for this. ”

In the article “A.S. Popov and His Activities in the Field of Radio” from the magazine “Navy Communications Bulletin” of 1945 P.N. Rybkin gives a curious addition: “In the winter of 1895/96, A.S. Popov improves his instruments and in March 1896 he demonstrates them at the 158th meeting of the Physicochemical Society. The meeting took place in the physical audience of the university. I was near the departure station, set at a distance of 250 m, in the building of the Chemical Institute. Suddenly they came to me and said that it was necessary to begin the transfer. I was confused with excitement: what to transmit? Suddenly an idea occurred to me - to convey the name of the famous physicist who experimentally proved the propagation of electromagnetic waves in space: <Heinrich Hertz>. Indescribable delight swept the audience in which Alexander Stepanovich was when these words were accepted there,

Thus happened the first in the world transmission of meaningful text by wireless telegraph ”[8].

Fig. 5. A.S. Popov receives the first radiogram in the world (an electronic copy of the reproduction of the picture of the artist A. Shimko from the newspaper Argumenty i Fakty).

Sam A.S. Popov repeatedly emphasized that the practical transceiver system invented by him is capable of sending and receiving code sequences of pulse signals of wireless telecommunication. He wrote about this in December 1895 in an article prepared for print “The device for detecting and recording electric vibrations” published in January 1896 [3,5]: “The device responds to a single oscillation with a short ring, continuously operating discharges of the spiral respond quite often , at approximately equal intervals by the following calls. ”Other testimonies of the meeting participants can be found in [3,5].

On April 14 (2), 1896, professor of the Department of Physics of the St. Petersburg Electrotechnical Institute and future director of the St. Petersburg Polytechnic Institute of Emperor Peter the Great, Professor Vladimir Vladimirovich Skobeltsyn (1863-1947) in the premises of the educational institution repeated the wireless transmission of semantic messages using equipment A.S. Popov, and the vibrator was installed by him in a building located at the end of the courtyard of the institute. The report on this demonstration, published in the April issue of the Postal and Telegraph Magazine, noted: “In conclusion, the speaker performed an experiment with the Hertz vibrator, which was placed in a neighboring wing on the opposite side of the yard. Despite the considerable distance and the stone walls located on the path of the propagation of electric rays, with any signal,

A thorough description of the circumstances associated with the initial telegram A.S. Popov can be found in the article: “On the question of the world's first radiogram” [9].

“Hertz Waves" in messaging abroad

Indirectly, the event is confirmed by the famous British-Italian businessman for the promotion of radio G. Marconi (Guglielmo Marchese Marconi; 1874-1937). Written under his dictation, the autobiographies The story of my life and Wireless Telegraphy, 1895-1919 (Wireless telegraphy, 1895-1919) largely contain selected, enthusiastic and laudable extracts from popular newspapers and magazines reflecting his successes. However, there is no indication in the memoirs of primacy in sending a telegram corresponding to his, seeming to the memoirs, 'bravura' life. It can be assumed that he was unable to get ahead of A.S. Popov in sending a telegram wirelessly, and pride and the desire to maintain status did not allow to boast of dispatches written in pursuit of the first message.

In the Nobel report of Wireless telegraphic communication in 1909, G. Marconi also did not claim to be the first to send the first semantic telegraphic combination of letters or words by wire [10]. In documents that have survived to our time — texts of patents, public speeches, epistolary correspondence — G. Marconi did not proclaim that he was the first to transmit the letter text by wireless telegraphy. His lead assistant, J. Kemp (George Stephen Kemp; 1858-1933), did not inform about this in the diaries, which he began to keep from July 1897 - immediately after he was recommended to him as a subordinate (Fig. 6). These things are not proved by biographers G. Marconi.

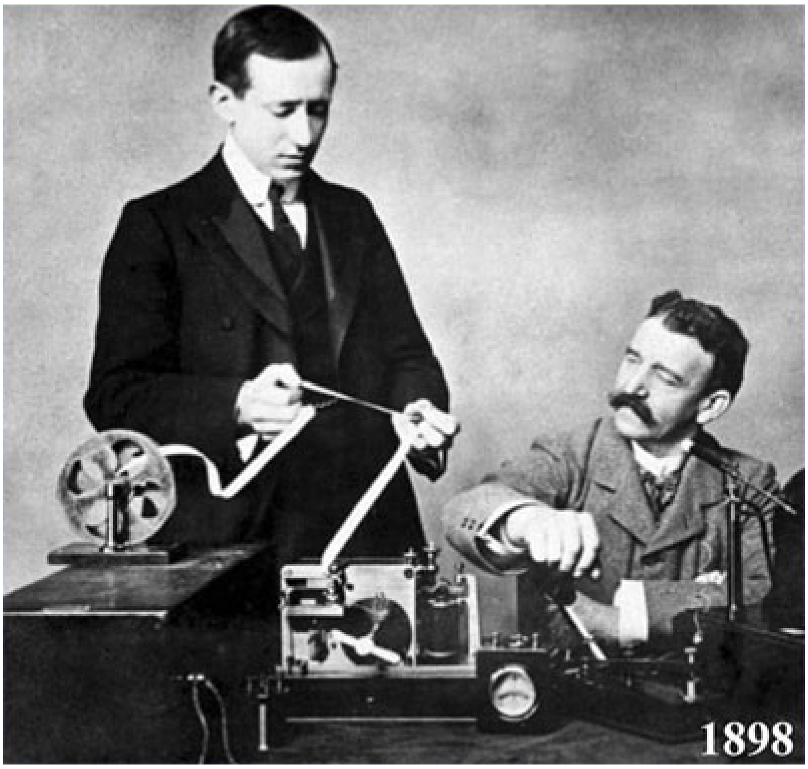

Fig. 6. G. Marconi (left) and J. Kemp for decoding messages from telegraph tape.

"To the co-authors" A.S. Popov according to the “invention of the radio” - the inventor of the “radio conductor” - the Frenchman E. Branley (Edouard Eugene Desire Branly; 1844-1940) and the inventor of the “coherer” - the Englishman Oliver Joseph Lodge (1851-1940) was well aware of the fact sending A.S. Popov through the air of the world's first semantic telegraphic letter message. E. Branly and O. Lodge survived A.S. Popova, however, in their scientific reports, numerous speeches and interviews in popular media and on the radio never expressed doubts about the event that took place on March 24 (12), 1896.

It should be understood that the superior wireless telegram sending could be accomplished through advanced technology of its time. However, G. Marconi did not have at his disposal equipment that implements the most important test in practice. In 1903, the famous Italian physicist A. Riga (Augusto Righi; 1850-1920), home physics teacher G. Marconi, in collaboration with another Italian physicist of German origin B. Dessau (Bernardo Dessau; 1863-1949) published a scientific review in the German publishing house " Telegraphy without wires ”[11]. The book can now be ordered and purchased online. Its Russian version is partially given in [5, p. 226-228]. Here is one of the assessments of the work of G. Marconi, taken from a historical folio: - “... use of a relay to close the local current circuit, as well as the use of the bell to automatically restore the resistance of the tube with sawdust, and finally, the use of the antenna, at least as an integral part of the receiver, we find, as already seen, in Popov, who described his device in 1895, whereas Marconi made his first application on June 2, 1896. Therefore, with regard to the essential details of his devices, Marconi cannot claim priority; others were ahead of him in this. ”

None of the scientists and engineers involved in wireless telegraphy at the end of the 19th century also stated that they were the first to send a telegram into space consisting of symbolic dots and dashes invented by the outstanding American inventor and artist S. Morse (Samuel Finley Breese Morse; 1791-1872).

By the way, on November 8, 1935, the US Supreme Court wrote in its decision: “Guglielmo Marconi, an Italian engineer, is sometimes called the father of wireless telegraphy. However, he was not the first to discover that telecommunications can be done without the help of wires. ”

Physicist, inventor of the vacuum diode (1904), member of the Royal Society of London, Englishman J. Fleming (John Ambrose Fleming; 1849-1945), who worked for many years in the company of G. Marconi, in a lecture Work of Marconi (Works of Marconi), which November 1937, he read at The Royal Society of Arts, London, that Marconi not the first person to transmit alphabetic signals by electromagnetic waves (Marconi was not the first to transmit letter signals using electromagnetic waves) [12].

In 2001, Francesco Paresce Marconi (born 1940) was the son of Degna Marconi (1908-1998) / the eldest daughter G. Marconi, the grandson of G. Marconi - an astrophysicist and inventor, the current head of the "European Southern Telescope Division observatory in Germany (Munich) and the chairman of the Marconi International Public Foundation in Italy prepared an article - Guglielmo Marconi: personal reflections on “an Italian adventurer” (Guglielmo Marconi: personal evaluations of the “Italian adventurer”) [13], where he described G. Marconi as a scientist: “Of course, G. Marconi was not a scientist, because E shows the inherent attributes of the typical scientist, and very rarely write articles in scientific journals. He did not have for this formal education and work experience. Being a Nobel Prize Laureate, throughout his life he was not considered a full member of the scientific community and, frankly, did not care to be one. He was not involved in the development of a comprehensive research policy for his country, as suggested by his high position as president of the National Council of Researchers, and, as a result, he did not leave school in the field of research of his experiments. ”

Bristol breakthrough

In May 1897, the head and chief engineer of The British General Post Office (British Post Office), a member of the Royal Society of London, W. Price (William Henry Preece; 1834-1913) proposed a comparative test of the transmitting and receiving equipment, which is based on discovery of the great German scientist and engineer G. Hertz (Heinrich Rudolf Hertz; 1857-1894) on the prevalence of invisible electromagnetic waves (EMC), and induction technology that implements the idea of W. Price about the possible passage of EMC underground and water between buried insulated earth bathtub metal plates. V. Pris's conviction was based on practical observations of the transmission of pulsed signals from one telegraph cable to another when they were parallel laid underground at a relatively close distance (up to 50-200 m).

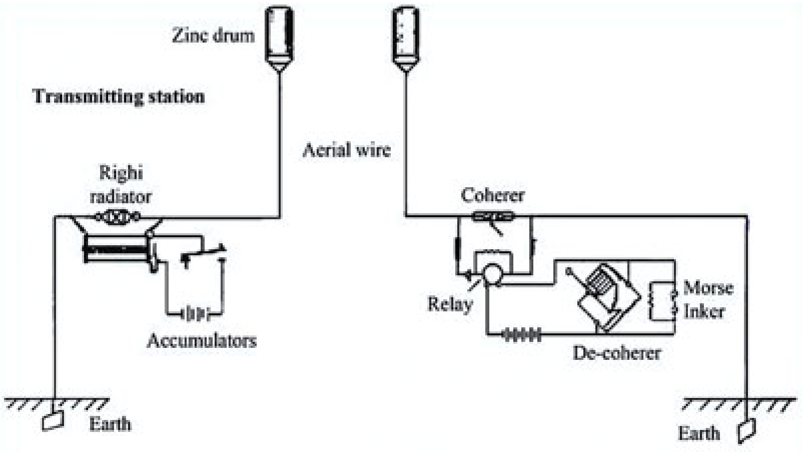

Fig. 7. Scheme of transmitting and receiving equipment used in May 1897 during tests in the Bristol Bay [14].

The tests were carried out in British Wales by transmitting signals to the mouth of the Severna River, which flows into the Bristol Bay, and for the first time in contact with the aquatic environment for equipment that transmits electromagnetic waves. They showed the full superiority of high-frequency (HF) wireless telegraphy. Along the way, it turned out that high-frequency electromagnetic waves above water propagate with less loss than in contact with the ground. Therefore, a new regular record was set for a range of 8.5 miles (~ 14 km) of EMC propagation from a transmitter to a receiver. Transmission and reception of telegraph symbols was carried out by transmitters designed and manufactured in the workshops of the British Navy to mast antennas in the form of vertical “long wires” with upper ends like copper or zinc hollow cylinders (at a distance of ~ 5.3 km) (Fig. 7) and on antennas in the form of vertical “long wires” highly suspended by inflatable kites wrapped in foil (at a distance of ~ 14 km) (Fig. 8)). The tests took place in the presence of invited military and civilian electrical engineers from the United Kingdom, Germany, Italy and some newspaper correspondents. However, the equipment diagrams were not shown to them. The tests took place in the presence of invited military and civilian electrical engineers from the United Kingdom, Germany, Italy and some newspaper correspondents. However, the equipment diagrams were not shown to them. The tests took place in the presence of invited military and civilian electrical engineers from the United Kingdom, Germany, Italy and some newspaper correspondents. However, the equipment diagrams were not shown to them.

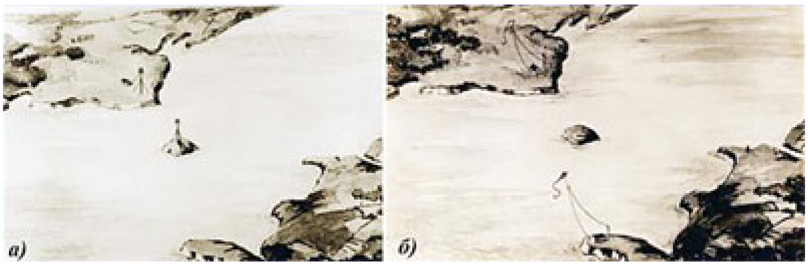

Fig. 8. Drawings by J. Camp of illustrations of the broadcasts of telegraph signals through the Strait of Bristol in May 1897: a) on mast antennas with ends in the form of metal hollow cylinders (~ 5.3 km); b) on antennas in the form of vertical "long wires" highly suspended by inflatable kites wrapped in foil (~ 14 km).

An explanation was made by V. Pris. There were no reports of a patent application filed by G. Marconi and its examination by W. Price on behalf of the British Patent Office. G. Marconi seemed to be present only as a promising assistant, tacitly carrying out the orders of V. Pris.

Less than a month later, on June 4th (Friday evening), W. Pryce gave a presentation on The Wireless Transmissionof Signals at The Royal Institution of Great Britain, London, where he evaluated the work held in the years 1896-1897. In his opinion, “G. Marconi did not do anything new. He did not discover any new rays; its transmitter is relatively new; its receiver is based on the Branly coherer. Columbus did not invent eggs, but showed how to put it on the sharp end. Nevertheless, Marconi, using well-known technical developments, presented an electric eye, thinner than all known electric tools, and a new telegraph system that would make accessible inaccessible places so far. ”In the lecture,“ for reasons of secrecy, ”V. Pris kept silent about

In 2004, the heirs of the British Wireless Telegraph and Signal Company, founded in 1897, renamed Marconi's Wireless Telegraph Company in 1900, declassified the collection of G. Marconi. Samples of the equipment were deposited at the Oxford University Museum of Natural History, and written documents were sent to the library of the school (The Oxford Bodleian Library).

Improved texts invented by V.Price became known for test radiograms transmitted during tests in the waters of the Gulf of Bristol. On May 13, 1897, the first two messages were sent 3.3 miles (~ 5.3 km) from Flat Hill Island to Cape Lavernock of the Bristol Bay and read: “Let it be so”, repeating: “Let it be so be it, so be it. " The second two messages contained the text: “The sun is unpleasant today, the wind ..” and a long series of images of the letter “V” in S. Morse code on a telegraph tape.

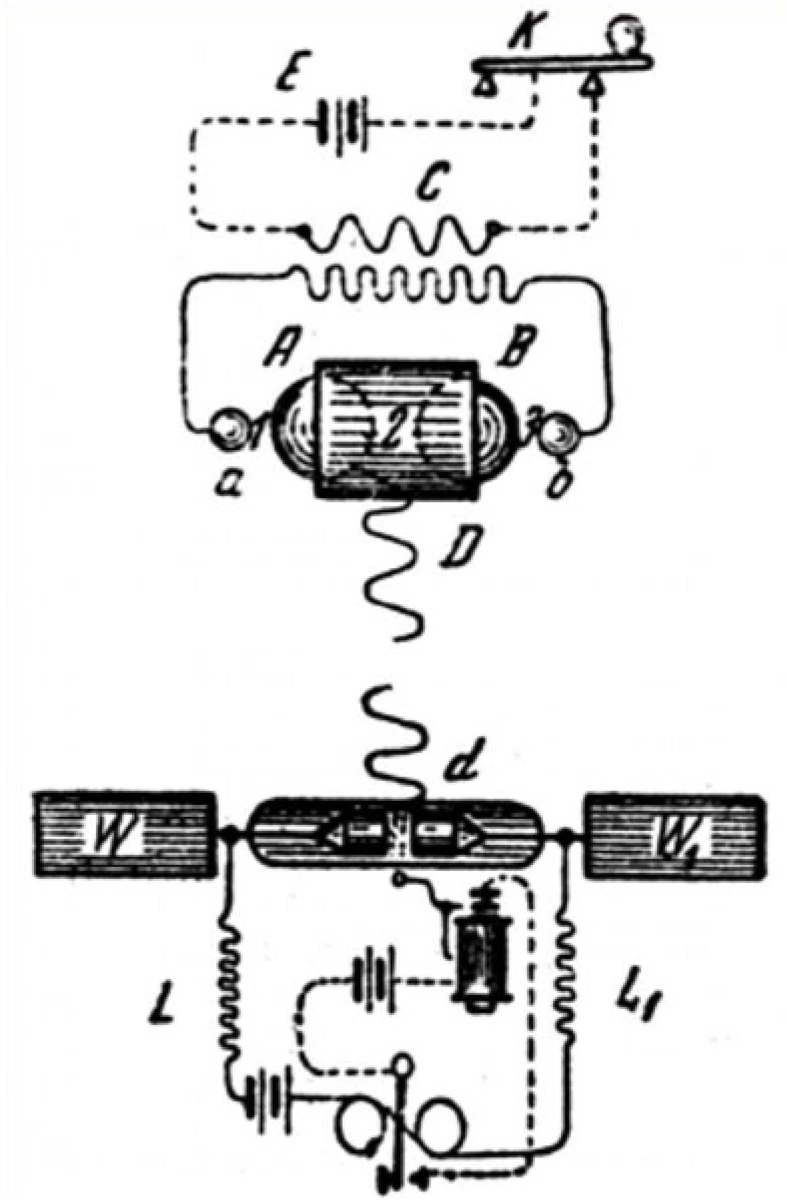

Fig. 9. Scheme of the transmit-receive system, published by W. Price in the June issue of the British journal The Electrician (Electrical).

A week later, on June 11, 1897, the popular British magazine The Electrician (Electrical Engineer) reprinted the report. V. Pryce published the scheme of the transceiver system (Fig. 9), but not completely - did not indicate the types of antennas used. The Russian-language version of the article by V. Pris and the attached scheme can be found in [15].

In Russia, A.S. Popov at lectures

A.S. Popov familiarized himself with a printed speech by V. Pris in July 1897 and was discouraged by its contents. According to the materials of article 29 (17) September 1897 in Odessa at the "IV deliberative congress of the chiefs of telegraphs, railway and other electrical engineers", he first reproduced the "Marconi experiment diagram" and stated that "its components are completely identical with my device." He no longer had intentions to disclose the details of his latest developments. Therefore, he refrained from spectacular proposals for telegraphing without wires of semantic alerts in public. Nevertheless, at the congress, he agreed to a demonstration of wireless telegraphy in action at a short distance: “An electric apparatus (transmission) was installed in the room occupied by the library of the Technical Society, and in a large hall (conference room -*author*), behind a thick stone wall, in front of the audience was a receiver invented by the speaker in 1895. The receiver consists of a small glass tube with iron filings, a galvanic battery and a telegraph apparatus. At the very moment when sparks were produced in the apparatus, signs appeared on the receiving telegraph apparatus. Moreover, the thick walls of the Technical Society did not at all serve as an obstacle ”[3,5].

It should be noted that by the beginning of 1897 A.S. Popov has already accumulated rich experience in using S. Morse's telegraph apparatus to record received signals. April 12 (March 31), 1897 at the Maritime Assembly of Kronstadt A.S. Popov gave a lecture on the possibility of telegraphy without conductors, accompanying it with visual and convincing experiments. With the beginning of spring 1897 A.S. Popov began to prepare equipment for experiments on the transmission of informative signals through electromagnetic waves over long distances.

In the report "On wire-less telegraphy" read on October 31 (19), 1897 at the St. Petersburg Electrotechnical Institute, A.S. Popov reported on the work done: “Our experiments were carried out at the expense of the Ministry of the Sea. Most of the tests were carried out at the Mine Detachment on the Transunda Raid of the Gulf of Finland by the Assistant Mine Officer Class Peter Nikolaevich Rybkin with the help of mine detachment officers ”[16]. However, he declined to offer to show in action the transmission of a telegram wirelessly: “Here is a device for telegraphing. We were unable to send a connected telegram, because we had no practice, all the details of the devices still need to be developed. ”

Some domestic authors of publications on the history of the invention of radio believe that the last sentence of A.S. Popov seemed to indicate his lack of previous practice of sending and receiving telegraph messages wirelessly. However, it is obvious that A.S. Popov understood the details and elements of the transceiver system delivered to the institute at the beginning of the lecture as a random set that did not pass testing and functioning in the kit. In addition, we must ask a legitimate question - “Why did V. Pryce in lectures and publications keep silent about wireless signal transmission in the Gulf of Bristol?”. Apparently, he had good reason for this. By all likelihood, A.S. Popov had no less reason to dissemble and hush up his successes in wireless telegraphy.

He adhered to the decision in subsequent years. Little was known and is now known, for example, about the texts and the number of messages identified by the newly developed “Telephone receiver for dispatches sent using electromagnetic waves” (without coherer and relay) in August / September 1899, when tested as part of the reception transmission system during the maneuvers and firing of the Black Sea Fleet. However, in the current situation, in the face of the need for quick measures to rescue fishermen and the General Admiral Apraksin warship in the Baltic in the winter of 1900, A.S. Popova was ready to transmit / receive 440 only official messages containing 6303 words; the longest telegram consisted of 115 words [17].

It should also be noted that A.S. Popov and G. Marconi never met, did not exchange telegrams, did not talk on the phone, and did not enter into official correspondence.

Fig. 10. G. Marconi (center) at a conference on nuclear physics in Rome (1931); near to his left is the outstanding physicist / chemist Maria Sklodowska-Curie (1867-1934), to the right is the famous theoretical physicist Niels Bohr (1885-1962).

As well as E. Branly and O. Lodge, G. Marconi survived A.S. Popova. He led a public lifestyle, was familiar with many celebrities from the world of physics (Fig. 10), actively participated in social life; everywhere he positioned himself as a great physicist, a brilliant inventor, an outstanding scientist, a talented designer, a capable developer ... In 1929 and in 1933 G. Marconi submitted applications for re-awarding him the Nobel Prize. For all this, no one had to hear from him claims to primacy in sending semantic messages by air.

Conclusion

After the first knowledge of experts and amateurs with the works of G. Marconi in September 1897 at the Electrotechnical Congress in Odessa, further A.S. Popov in his lectures already regularly informed the audience about his contribution to the promotion of radio. At the same time, in the explanations, he used the scheme of the transceiver system, captured by W. Price in The Electrician magazine; the receiver and transmitter circuits from G. Marconi's first patent were unknown to him. After drowning A.S. Popov in Russia pre-revolutionary (1917) and during the Soviet era hundreds of articles and reviews were published devoted to him and the invention of radio. By analogy with A.S. In the text materials, the authors considered it to be Popov that it was necessary to inform readers about the achievements of G. Marconi with a diagram of the equipment connections from the report and publication of V. Pris.

Abroad, the discovery and invention of radio A.S. Popov was silent. And now in economically and technically developed countries it is practically impossible to find information about A.S. Popov. Great Britain is not quite trivial. In

Encyclopaedia Britannica (British Encyclopedia) A.S. Popov was given about one page, contains information about his acts, but at the same time, the primacy of the work of G. Marconi in the invention of radio is claimed. Although one can only wonder why the historians of the British Encyclopedia refer G. Marconi to engineers and inventors of the radio, if that was unknown to the knowledge of physics even from the school course; apparently these authors have the same knowledge in physics as G. Marconi had. Moreover, these historian authors are silent that G. Marconi was a wonderful PR man, the organizer of experiments, production and seller of electrical radio equipment. In 1946, the British Broadcasting Corporation (BBC) founded the BBC Russian Service, which first entered the Celestial Empire on March 24, 1946, exactly 50 years after A.S. Popov's first radiogram (formally, "The Russian BBC Service" was founded on March 26, 1946 -*author*). In 2016, BBC Russian Service celebrated the 120th anniversary of the transfer of A.S. Popov's first radiogram [18].

On January 30 (18), 1902, Russian physicist, researcher of secular changes in the Earth's magnetic field, philosopher, nominee of the Russian branch of the Nobel Committee and professor of the Imperial University of Moscow Nikolay Alekseevich Umov (1846-1915) in the Moscow newspaper Russkaya Vedomosti (Russkiye Vedomosti), arguing about whether technology can give people freedom of speech, wrote: "The inventor of a telegraph without wires A.S. Popov, of course, did not suspect the enormous service rendered to mankind by the fact that the time was not so far ... when the devices of the invented telegraph became household appliances, a citizen from his office would tell his thoughts to all of Moscow! Although this time is not close, but it is not a fantasy! ... Thus, knowledge gives people spiritual values by removing the ground from under the feet of various prohibitions. "

To this day, tens of thousands of terrestrial and satellite broadcasting stations operate in the world, millions of amateur radio operators communicate in the shortwave ranges, and the number of receivers is not countable. All modern information technologies, such as television, radar, mobile telephony, wireless Internet, satellite navigation, are based on the invention of A.S. Popov and his followers.

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